

Message Text

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PAGE 01 MOSCOW 15050 201906Z

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SUBJ: TTBT/PNE NEGOTIATIONS: SOVIET PRESENTATION ON YIELD MEASUREMENT
EQUIPMENT. TTBT/PNE DELEGATION MESSAGE NO. 61

1. DR. VOLKOV OF TECHNICAL DEPARTMENT OF STATE COMMITTEE
ON UTILIZATION OF ATOMIC ENERGY DESCRIBED SOVIET DISCREET
METHOD FOR MEASURING SHOCK WAVE VELOCITY IN HYDRODYNAMIC
REGIME OF EXPLOSION IN ORDER TO DETERMINE YIELD OF EXPLOSION.

2. FOR THIS METHOD, VOLKOV SAID EQUATION OF STATE OF
ROCK AND STEMMING MATERIAL WAS NEEDED. DENSITY OF STEMMING
MATERIAL SHOULD BE EQUAL TO THAT OF ROCK WITHIN 5 PERCENT.
THE DIAMETER OF EMPLACEMENT HOLE IN IMPLACEMENT REGION
MUST BE KNOWN.

3. EQUIPMENT TO MEASURE SHOCK WAVE VELOCITY CONSISTS OF
TWO GROUPS OF SWITCHES, TEN TO FOURTEEN IN TOTAL NUMBER.
TWO GROUPS ARE MOUNTED PARALLEL ABOVE CANISTER ON PIPE
WHICH SUPPORTS CANSITER, SPACED AT DISTANCES OF 0.5 - 2 METERS
OUT TO MAXIMUM DISTANCE IN METERS OF 6 - 10 TIMES CUBE
ROOT OF YIELD. TWO GROUPS OF SENSORS ARE USED IN CASE OF
FAILURE. SIGNAL FROM EACH SWITCH IS TRANSMITTED BY A
SINGLE-CONDUCTOR, SHIELDED CABLE TO SURFACE. THESE SMALL
CABLES ARE ASSEMBLED IN GROUPS OF SEVEN ITNT ARMORED CABLE
DESCRIBED AS LOGGING CABLE (SEE PARA 11). LENGTH OF THIS

SECRET

SECRET

PAGE 02 MOSCOW 15050 201906Z

CABLE CAN RANGE UP TO 3 KILOMETERS. SIGNALS FROM ALL

SWITCHES GO THROUGH SIGNAL FORMER OR PROCESSOR AT SURFACE AND ARE THEN TRANSMITTED VIA TWO COAXIAL CABLES TO RECORDERS, WHICH CAN BE EITHER DIGITAL OR OSCILLOSCOPE.

4. SINGLE-CONDUCTOR, SHIELDED CABLES ARE MAINTAINED AT CONSTANT POTENTIAL (300 TO 1000VOLTS) SUPPLIED BY SIGNAL FORMER OR PROCESSOR. WHEN SWITCH IS CLOSED BY SHOCK WAVE, CHARGE STORED IN CABLE IS DISCHARGED, SENDING SIGNAL UP CABLE. IN ANSWER TO QUERIES, RISE-TIME OF SIGNAL AT SIGNAL PROCESSOR WAS SAID TO BE 1 TO 2 MICROSECONDS WITH A RESOLUTION OF 0.1 TO 0.2 MICROSECONDS. TIME SEPARATION OF PULSES FROM SWITCHES STATED TO BE TENS OF MICROSECONDS. SWITCHES ARE PLACED WITH A VARIABLE BUT KNOWN DISTANCE BETWEEN THEM WHICH ENABLES EACH PULSE TO BE ASSOCIATED WITH A GIVEN SWITCH.

5. ZERO TIME IS MARKED BY CLOSING OF FIRST SWITCH MOUNTED AT TOP OF CANISTER. DISTANCE OF SWITCHES IS MEASURED FROM DATUM POINT MARKED ON CANISTER GIVEN BY PARTY CARRYING OUT EXPLOSION.

6. VOLKOV SAID IN ORDER TO EMPLOY THIS METHOD FOR GROUPS OF EXPLOSIONS, DISTANCE IN METERS BETWEEN EXPLOSIONS MUST BE GREATER THAN 10 TIMES CUBE ROOT OF YIELD IN KILOTONS. DIFFERENCE IN TIME IN MILLISECONDS BETWEEN EXPLOSIONS MUST BE LESS THAN 0.1 TIMES CUBE ROOT OF YIELD IN KILOTONS.

7. IN CASE OF GROUP OF EXPLOSIONS IN SAME EMPLACEMENT HOLE, VOLKOV SAID DISTANCE BETWEEN EXPLOSIONS MUST BE GREATER THAN 6 METERS TIMES CUBE ROOT OF YIELD IN KILOTONS. EXPLOSIVES MUST BE DETONATED, ONE AFTER ANOTHER, FROM BOTTOM UP, WITH TIME INTERVAL IN MILLISECONDS BETWEEN EXPLOSIONS GREATER THAN 0.1 TIMES CUBE ROOT OF YIELD IN KILOTONS. (COMMENT. LATTER NUMBER MUCH LESS THAN US VALUE. WE WILL CLARIFY NEXT MEETING. END COMMENT.)

8. VOLKOV SAID PLACEMENT OF SWITCHES WOULD BE AT INSTRUCTIONS OF VERIFYING SIDE, WHO COULD OBSERVE ACTUAL POSITIONING OF PROBES ON COLUMNS AND MAKE MEASUREMENTS OF LOCATIONS. STEMMING OF THAT REGION OF EMPLACEMENT HOLE WOULD ALSO BE OBSERVED.

SECRET

SECRET

PAGE 03 MOSCOW 15050 201906Z

9. VOLKOV SAID MAXIMUM ERROR OF YIELD DETERMINATION BASED ON EXPERIMENTAL DATA FOR DIFFERENT ROCKS AND WIDE RANGE OF YIELDS WAS 30 PERCENT.

10. VOLKOV ASKED USDEL QUESTIONS CONCERNING SLIFER DATA. WAS TOLD YIELD DETERMINATION DEPENDED UPON USE OF CALIBRATION DATA DETERMINED ON MANY EXPLOSIONS AND THAT

CALIBRATION DATA WAS ESSENTIALLY INDEPENDENT OF ROCK. VOLKOV DID NOT SEEM TO DISAGREE WITH THIS IN SPITE OF HIS EARLIER REMARKS (PARA 2). DURING DISCUSSION, QUESTION WAS ASKED HOW US ARRIVED AT ZERO TIME. USDEL REPLIED FROM EITHER VERY EARLY PULSE OCCURRING ON SIGNAL CALBE OR SUPPLIED BY HOST DIRECTLY FROM SAME SOURCE AS FIRING SIGNAL. RODIONOV ASKED IF US MEANT EARLY PULSE WAS OF ELECTROMAGNETIC NATURE. US SIDE ANSWERED YES. NO FURTHER DISCUSSION ON SUBJECT OCCURRED. THE USDEL WAS SHOWN DISCRETE MEASURING EQUIPMENT DESCRIBED ABOVE.

11. AFTER DISCUSSION, US SIDE WAS SHOW SOVIET EQUIPMENT FOR MEASURING SHOCK VELOCITY. BEZUMOV REFERRED TO EQUIPMENT AS "MODEL". STAND-OFF BRACKETS HOLDING SWITCHES WERE ATTACHED BY CLAMPS TO FOUR-INCH HOLLOW ALUMINUM PIPE, DESCRIBED AS SIMILAR TO PIPE USED TO SUPPORT CANISTER. SWITCH HOUSING ON EACH BRACKET ABOUT EIGHT INCHES FROM ALUMINUM PIPE. SWITCHES ALL ABOUT ONE-FOURTH INCH IN DIAMETER BY ONE INCH IN LENGTH. EACH SWITCH IS ATTACHED TO A SINGLE-CONDUCTOR SHIELDED CABLE ABOUT ONE-EIGHTH INCH IN DIAMETER. CABLE, IN GENERAL APPEARANCE, IS ABOUT LIKE AUDIO CABLE WITH OUTER BRAIDED METAL SHIELD. SEVEN OF THESE SMALL CABLE ARE ENCLOSED IN AN OUTER-WRAPPED STEEL SHIELD. CABLE REFERRED TO AS "LOGGING CABLE" AND SAID TO BE MUCH MORE EXPENSIVE THAN ONE-CENTIMETER COAXIAL CABLE. LOGGING CABLE IS ATTACHED TO SIGNAL PROCESSOR WHICH WOULD BE AT THE SURFACE. THE SIGNAL PROCESSOR ACCEPTS TWO LOGGING CABLES. DATA IS TRANSMITTED TO RECORDER BY TWO COAXIAL CABLES (LIKE RG 213). SIGNAL PROCESSOR HAS ATTACHMENT SO THAT EACH INDIVIDUAL SWITCH AND CABLE CAN BE TESTED.

12. IN RESPONSE TO QUESTIONS, VOLKOV SAID THE SWITCHES
SECRET

SECRET

PAGE 04 MOSCOW 15050 201906Z

AND CABLE WOULD WORK UP TO 800 ATMOSPHERES PRESSURE AND 100 DEGREES CENTIGRADE. (COMMENT: THE 800 ATMOSPHERES SEEMS TOO HIGH; 500 ATMOSPHERES AT BEST AND PROBABLY MUCH LESS FOR EQUIPMENT SEEM. END COMMENT.)
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